

Design Course

Digital Typography - 2

Understanding Type as Bits

by

Prof. Girish Dalvi

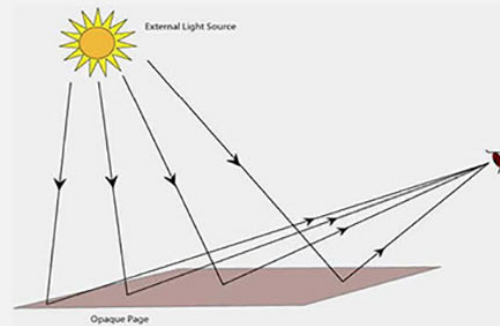
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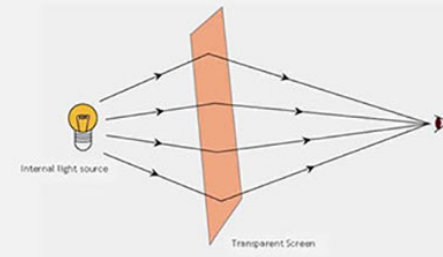
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Printed Page and Reflected Light



A printed page is viewed in reflected light.

Monitor and Internal Light Source



Any design on a computer monitor is seen with an internal light source.

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Introduction

The aim of this short course is to introduce students to some of the basic concepts in using typefaces for Web based designs. The language and structure of this course has been kept lucid and simple, keeping in mind undergraduate students of art and design.

We must begin by understanding how Web based designs are different than traditional print based designs. The first and most basic difference regarding these is the **certainty of output**.

In traditional print based designs, since the final output is a physical copy produced by a printer, there is a great deal of certainty about how the final design would look, and how it will be consumed. In contrast to this, one cannot say with certainty how your website will be viewed. Once it is designed it is uploaded on to a web server, from which it can be viewed on a desktop computer, which has a large and wide LCD monitor or on a small laptop which has a small LCD screen, or even on a mobile phone which has an ever smaller screen. From a system point of view, the design created by you would be processed by several different operating systems. Typographically these systems might not contain the fonts that you have used for your designs—this brings about a certain amount of uncertainty in the final rendering of your designs.

In traditional print based designs, since the final output is a physical copy produced by a printer, there is a great deal of certainty about how the final design would look, and how it will be consumed. In contrast to this, one cannot say with certainty how your website will be viewed. Once it is designed it is uploaded on to a web server, from which it can be viewed on a desktop computer, which has a large and wide LCD monitor or on a small laptop which has a small LCD screen, or even on a mobile phone which has an ever smaller screen. From a system point of view, the design created by you would be processed by several different operating systems. Typographically these systems might not contain the fonts that you have used for your designs—this brings about a certain amount of uncertainty in the final rendering of your designs.

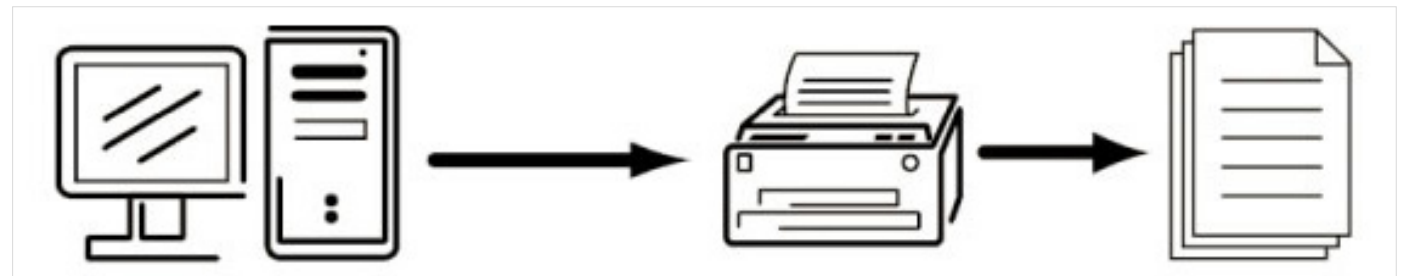


Figure 1: Simplified process for traditional print based designs.

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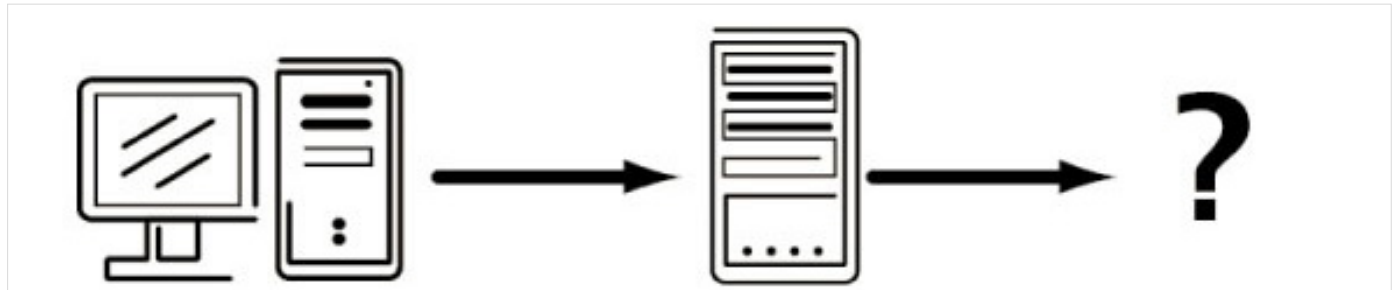


Figure 2: Uncertainty in the output of web based designs.

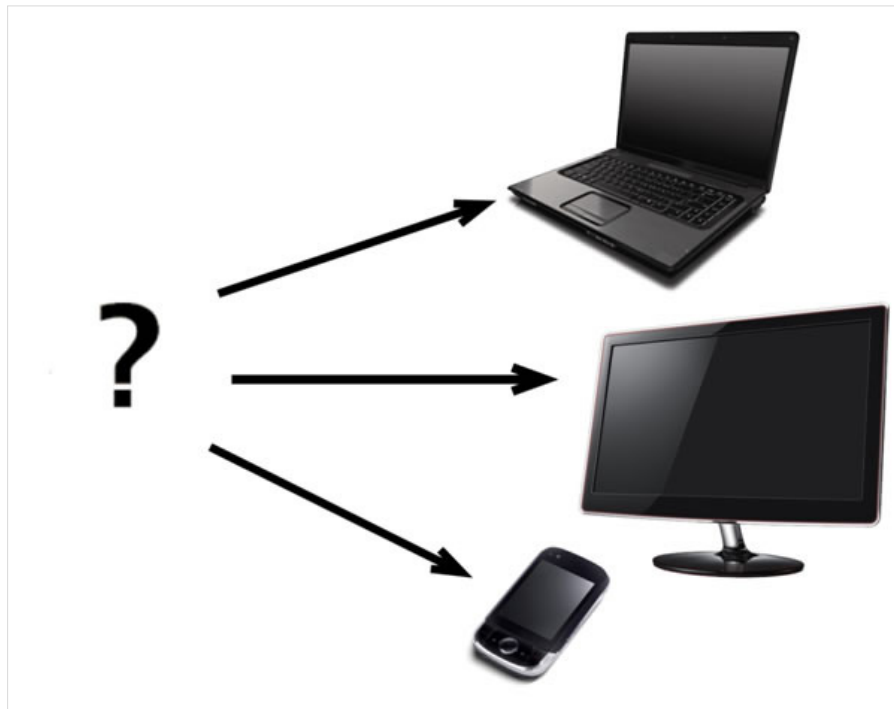


Figure 3: The uncertainty rises from the fact that any given website can be seen on different devices.

Assignment 1:

- In the given assignment, please try and answer the following questions.
- Use the available books in your library, online sources or talk to experienced graphic/ type designers.
- After noting down the answers, *please discuss your answers with your colleagues and faculty members.*

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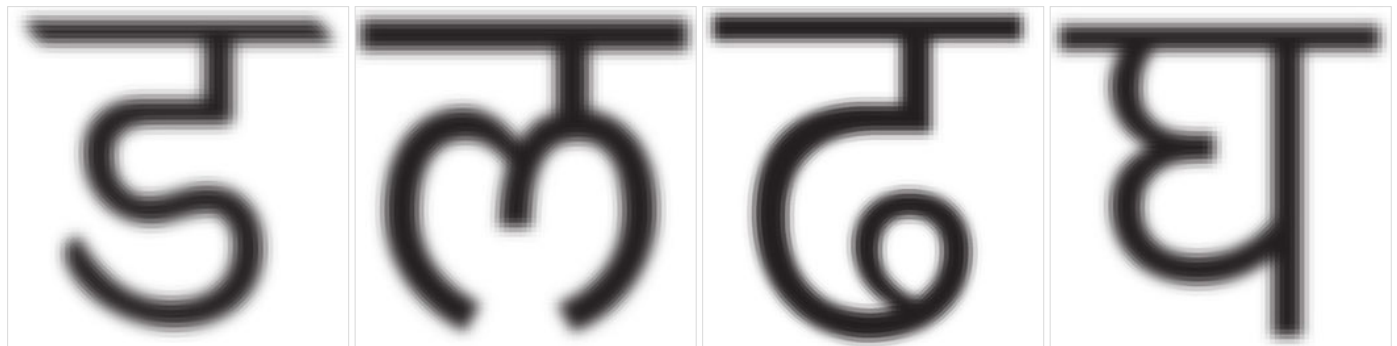
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There is a possibility that you might not reach a single unambiguous answer. The goal of the assignment is to stimulate a discussion rather than to come up with a definite answer. Some of the questions are purposefully challenging, complex and ambiguous in nature; they are meant for the more experienced students and faculty, but undergraduates should nonetheless attempt to answer them.

Q1. List down various mediums that are incorporated in traditional print based publications.
Describe their properties—such as size, number of colours, fonts, layouts etc.

Q2. List down various mediums that web based designs need to be prepared for.
Describe their properties—such as size, number of colours, fonts, layouts etc.



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Light Sources

In the earlier section we saw how we can be certain about the output of our designs in traditional print mediums. The same cannot be said about web based designs, as the device on which the design will be viewed is not known. Along with this there are certain basic differences in the approaches to designing for print and for the web. One of the first differences that we come across is that of light sources.

Design elements on a printed page, be it text or graphics are seen in reflected light. Their visibility is dependent on an external source of light. The rays of light are emitted from an external light source such as the sun; they then are reflected back opaque page and are then seen by the viewer. (See figure 1)

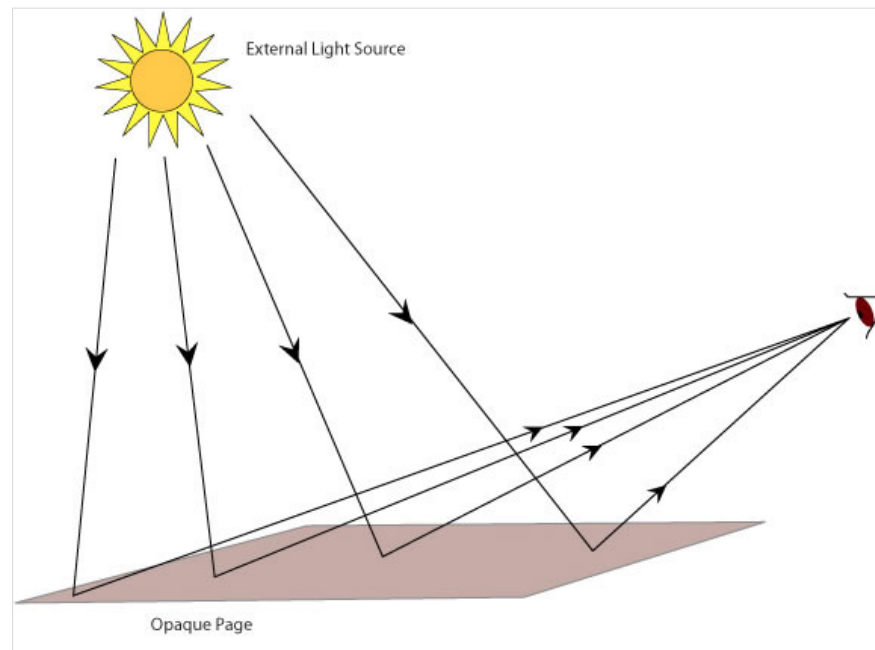


Figure 1: A printed page is viewed in reflected light.

Web (software) based designs use a completely different principle to display text and graphics. When a design is seen on a computer monitor or a mobile device, the graphic elements in the design are illuminated by an internal light source which is present in the device itself. Graphical elements on a monitor are illuminated and displayed directly.

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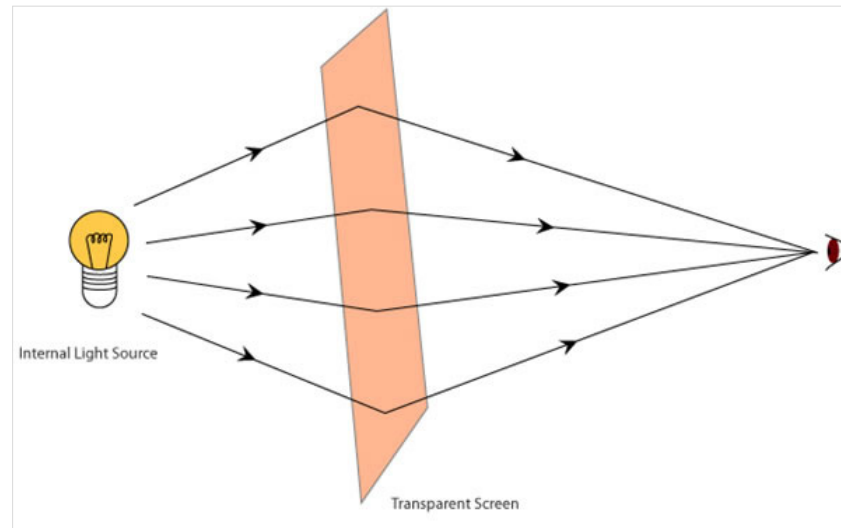


Figure 2: Any text on a monitor is read with an internal light source.

This difference in the light sources has many consequences on how graphical elements and text are perceived by the viewer. So a graphic designer must be aware of how a design would look on screen and how it would look on paper. Designers must be aware of the advantages and disadvantages of each of the mediums, and be careful while translating their designs from paper to screen and vice versa.

For Example:

Colour is perceived differently on paper and on screen due to the differences in light sources. Most colours usually look brighter on the screen; this can be an advantage as more vibrant colours can then be used on screen. But designers must be careful while using light colours, especially in setting text. Light colours on screen have lower contrast. So a line of yellow coloured text on a white background might be very difficult to read on screen. Along the same lines colours such as gold, silver, as well as a range of fluorescent colours are available exclusively for print and cannot be created on screen.

Assignment 2:

- In the given assignment, please try and answer the following questions.
- Use the available books in your library, online sources or talk to experienced graphic/ type designers.
- After noting down the answers, *please discuss your answers with your colleagues and faculty members.*

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challenging, complex and ambiguous in nature; they are meant for the more experienced students and faculty, but undergraduates should nonetheless attempt to answer them.

Q3. Describe in your own words how the source of light affects the text that is read. Determine what effect does light have on the basic elements of design, such as colour, typography, layout etc.

Q4. Read up and search “e-ink technologies” and e-book readers. Discover the source of light that they use, and hence determine its advantages and disadvantages.

Q5. Compare print based design with screen based designs and e-ink technology. Highlight their pros and cons.

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Screen Types

Electronic devices mostly convey (display) information through the use of a display device. These display devices make use of certain display technologies such as LED (segmented) display, LCD, CRT displays etc. Each of these has a '**display resolution**' which is the maximum number of distinct **pixels** (picture elements) that the device can display. A Pixel is the smallest screen element in a display. While representing raster images it is the smallest unit of a picture.

Raster images (such as photographs) are made up of millions of pixels, each having a specific colour and location. An important parameter that defines the pixel is its **aspect ratio**, which is the ratio of the width of the pixel to its height. It is important to note here that a pixel is not always a square (ratio 1:1); there are many rectangular pixels which have different ratios, such as 4:3 and 16:9.

Furthermore, it is also possible that pixels are not rectangular in nature. They can be circular and even capsule shaped. On a computer each pixel is a rectangle, but when displayed on a device they can be displayed through a series of circles, rectangles or capsules.

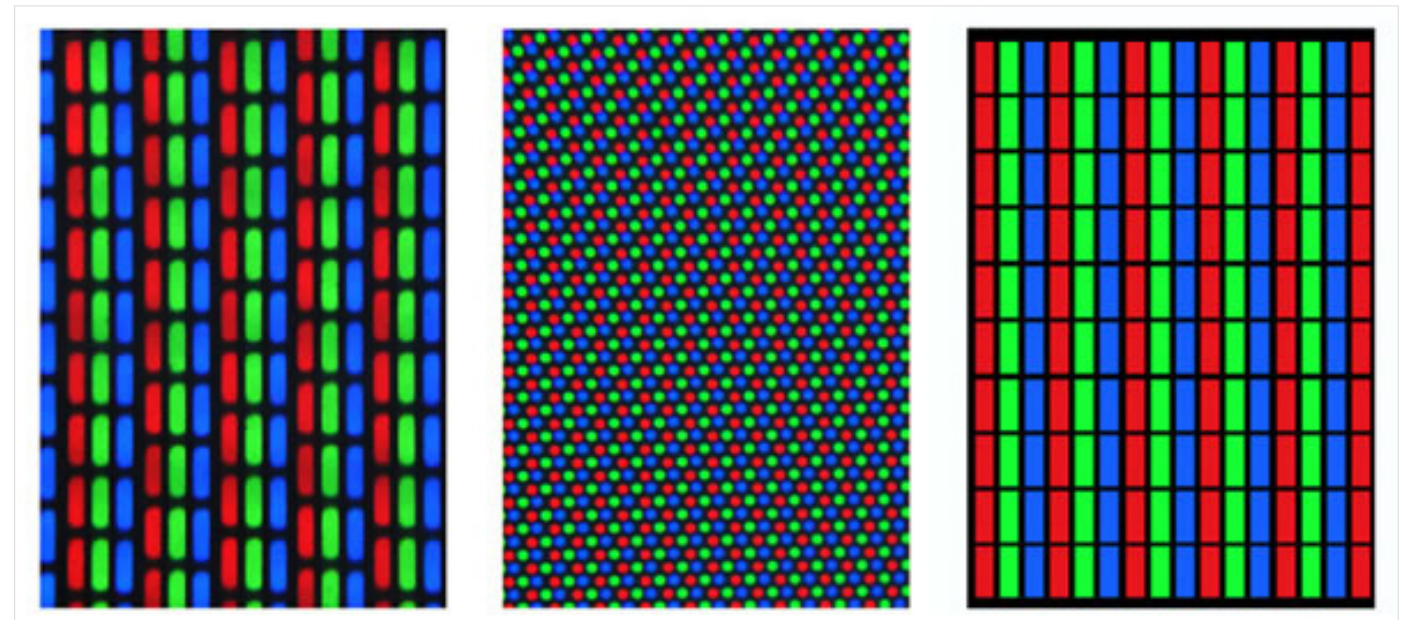


Figure 1: Pixels on a TV set, on a CRT Computer Monitor and LCD Monitor.

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The above figure shows the different shapes of pixels that are seen in some common display devices.

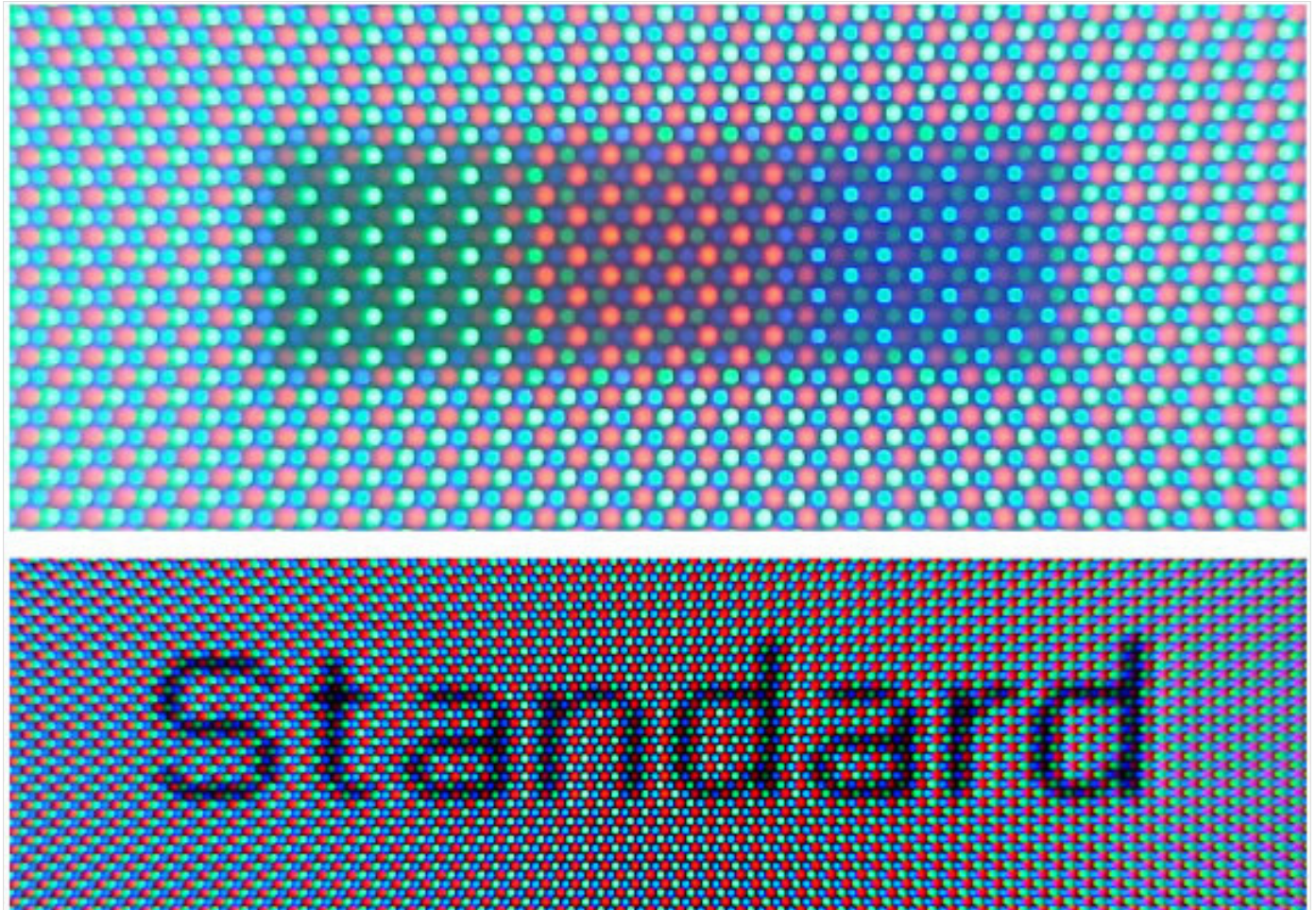


Figure 2: Pixels on a Cathode Ray Tube Computer Monitor and the text displayed in it.

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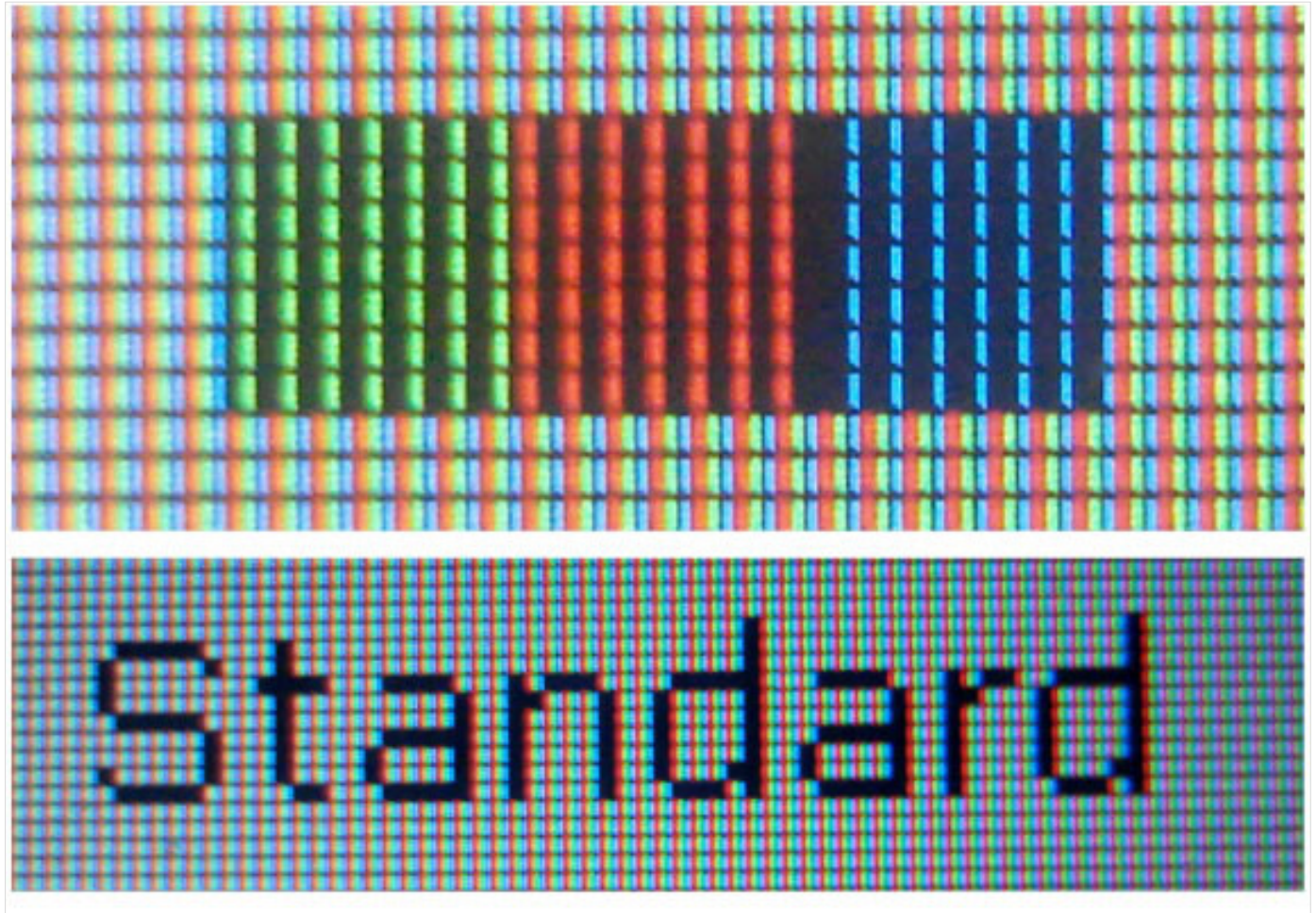


Figure 3: Pixels on a LCD Computer Monitor and the text displayed in it.

When text is fitted on to a grid of pixels, it might appear jagged. The jagged edges are called artifacts or the text is called aliased text (or edge). Smoothing these artifacts or removing aliasing from a text to make it look smoother and to make it blend properly with its background is called **anti-aliasing**.

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In the figure given below, the letter on the left has jagged edges in comparison with the letter on the right which is anti-aliased.



Figure 4: Aliased letter (on the left) and anti-aliased letter (on the right).

Assignment 3:

- In the given assignment, please try and answer the following questions.
- Use the available books in your library, online sources or talk to experienced graphic/ type designers.

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- After noting down the answers, *please discuss your answers with your colleagues and faculty members.*

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Q6. List down the various aspect ratios of pixels used today?

What are the different resolutions that are used in today's devices?

Q7. What are the different shapes of pixels?

Why do different devices, have pixels of different shapes and sizes?

Q8. What are the methods used for smoothening fonts?

Find out and explain, "SubpixelRendering Optimization" technology.

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Fonts for the Screen

The square grid of the screen presents a new kind of challenge to font designers. Type designers have had to design letters which fit into the pixel grid presented by various electronic devices. Screen fonts are fonts which are specially designed considering the limitations of a pixel grid. Their intended use is for display on digital devices. In some low end devices such as mobiles, bitmap fonts are used instead of vector fonts.

Common examples given for fonts that are designed for the screen are:

- Verdana and
- Georgia

Verdana is a sans
serif font **designed
for the screen.**

Figure 1: Verdana is a sans serif font designed by Matthew Carter.

Gill Sans is a sans serif
font **which is used in
print publications.**

Figure 2: Gill Sans is a font which was designed by Eric Gill before the use of DTP computers.

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A side-by-side comparison of the Georgia and Centaur typefaces. The text 'Georgia x-height' is followed by 'Centaur x-height'. Both are in a black serif font, with the Georgia version appearing slightly more condensed and the Centaur version slightly more spaced out.

Figure 3: Compare x-heights of the fonts, both the fonts are at the same point size.

A side-by-side comparison of the letter 'A' in two different fonts. The text 'A x-height' is followed by 'A x-height'. The first 'A' is in a standard sans-serif font, and the second 'A' is in a slightly more stylized sans-serif font. Both are in a black font, with the second 'A' appearing slightly more condensed and the first 'A' slightly more spaced out.

Figure 4: Compare x-heights of the fonts, both the fonts are at the same point size.

In the above figures we have shown fonts which are largely used for print and fonts which are specially designed for the screen. Compare the visual features of these two typefaces, and try and deduce what design features differentiate the two kinds of fonts. As a hint we could begin by comparing the horizontal and vertical proportions (such as x-heights) of the two kinds of fonts.

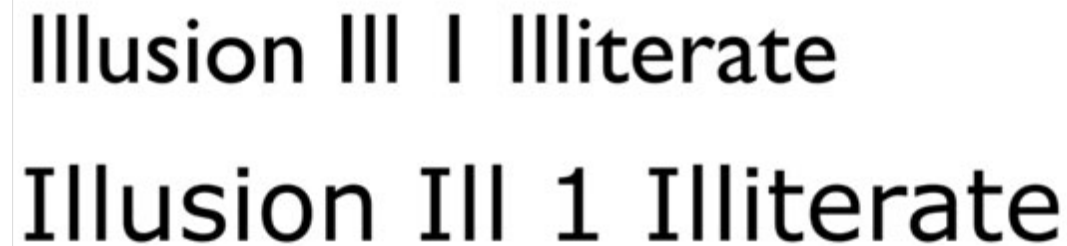
A comparison of the characters 'Illusion', 'Ill', 'I', and 'Illiterate' in two different fonts. The top line shows the characters in a standard sans-serif font, and the bottom line shows them in a slightly more stylized sans-serif font. The characters are in a black font, with the bottom line appearing slightly more condensed and the top line slightly more spaced out.

Figure 5: Note differences in characters such as lowercase l and upper case I and the numeral 1.

If we study Verdana, we realize that its legibility at small point sizes can be attributed to many factors. Its basic shape is derived from a square grid. Along with this it is more loosely spaced which helps legibility at small sizes. The bold version of the font is also darker than print based fonts. Letters such as j l I, l and 1 have been designed so that they can be easily differentiated.

Besides the visual features, screen fonts are hinted. Font **hinting** is the process in type design where set of instructions are embedded in a font so that the computer can adjust the drawing outlines on a small raster grid.

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Hinting is especially used to make fonts more legible on low screen resolutions. One important factor for the clear legibility of screen fonts is the quality of hinting that they have.

Assignment 4:

- In the given assignment, please try and answer the following questions.
- Use the available books in your library, online sources or talk to experienced graphic/ type designers.
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Q9. List out the visual design features in screen fonts such as Verdana and Georgia that make them more legible on the screen as compared to print fonts.

Q10. Verdana and Georgia were fonts designed for the screen in the 90's. Find out and list down fonts designed for the screen in recent years.

Q11. Explain the phenomena of hinting. What is its purpose? How is hinting actually done?

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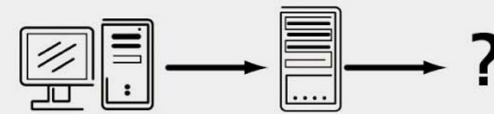
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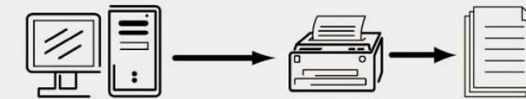
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Uncertainty in the output of web based designs

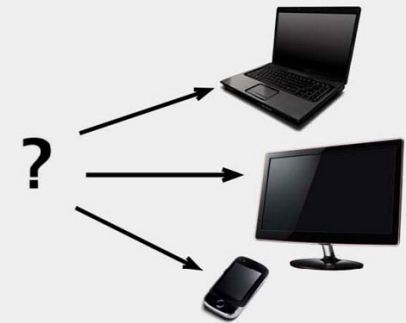


Traditional Publishing



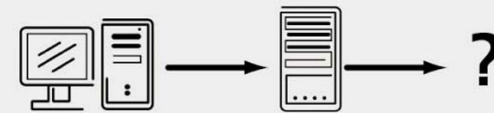
Web Publishing

Website seen on different devices

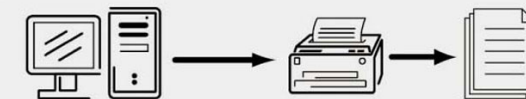


The uncertainty rises from the fact that any given website can be seen on different devices

Uncertainty in the output of web based designs

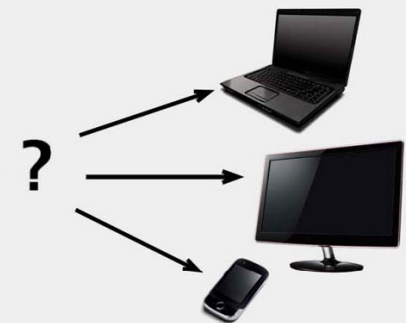


Traditional Publishing



Web Publishing

Website seen on different devices



The uncertainty rises from the fact that any given website can be seen on different devices

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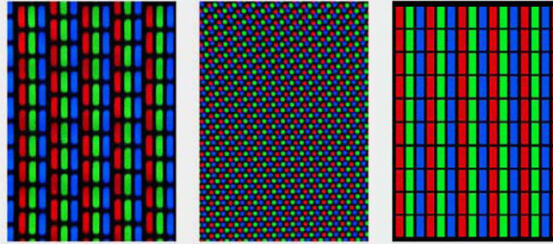
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Pixels are not necessarily the same shape



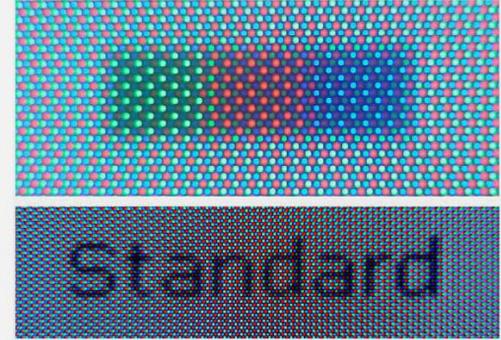
21" TV CRT

17" PC CRT

Typical Colour LCD

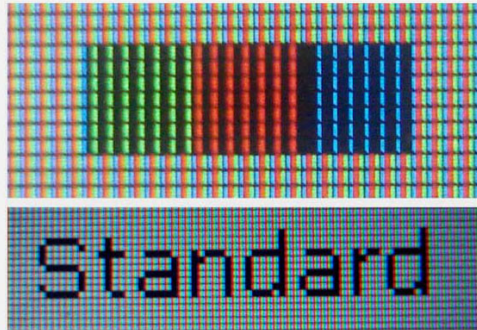
Pixels on a TV set, on a CRT Computer Monitor and LCD Monitor.

PC CRT (Cathode Ray Tube) monitor



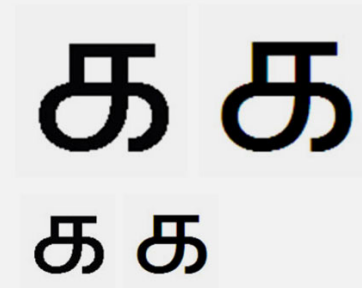
Pixels and Text on a CRT Computer Monitor

PC LCD (Liquid Crystal Display) Monitor



Pixels on a LCD Computer Monitor and the text displayed in it.

Aliased letter and anti-aliased letter



Aliased letter (on the left) and anti-aliased letter (on the right).

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Verdana is a sans serif font designed by Matthew Carter. It was **designed for screen usage.**

Georgia is a serif font designed by Matthew Carter. It was also **designed for screen usage.**

Georgia x-height Centaur x-height
Verdana x-height Gill x-height

Compare design features of fonts designed for the screen, all the fonts are presented in the same point size.

I Illiterate Illusion
1 Illiterate Illusion

Compare design features of fonts designed for the screen, both fonts are presented in the same point size.

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Links:

Links:

- Useful resource e-links related to 'Graphic Design' in India - includes Communication Design, Publication Design and Packaging Design
- International resource related to 'Graphic Design'
- Visual Communication Design at IDC IIT Bombay

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Contact Details

This documentation for the course was done by Girish Dalvi, Ph.D. Student at IDC, IIT Bombay.

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